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A WEEKLY JOURNAL FOR MASTERS MISTRESSES AND STUDENTS

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Query Column.

Algebra.

1. PRACTICAL.—Solve:—

$$(1)\ \frac{1}{x+\sqrt{2-x^2}}+\frac{1}{x-\sqrt{2-x^2}}=x.$$

$$(2)\ x=7\sqrt{2-x^2}.$$

$$(1)\ \frac{1}{x+\sqrt{2-x^2}}+\frac{1}{x-\sqrt{2-x^2}}=x$$

$$\frac{x-\sqrt{2-x^2}+x+\sqrt{2-x^2}}{x^2-(2-x^2)}=x$$

$$\frac{2x}{x^2-2+x^2}=x$$

$$\frac{2x}{-2}=x$$

$$2x=-2x$$

$$4x=0$$

$$\therefore \underline{x=0.}$$

$$(2)\ x=7\sqrt{2-x^2}$$

Squaring each side] $x^2=49(2-x^2)$

$$=98-49x^2$$

$$50x^2=98$$

$$x^2=\tfrac{98}{50}$$

$$=\tfrac{49}{25}$$

$$\therefore \underline{x=\pm\tfrac{7}{5}}$$

Arithmetic.

1. J. JOHNSON.—A person invests £3,500 in railway ordinary stock at 87½. The railway pays a dividend at the rate of 4 per cent. per annum for the first half-year, and the price of the stock rises to 91. He sells half his stock, and buys 6 per cent. preference shares at 177. The next half-yearly dividend is at the rate of 6 per cent. per annum on the ordinary stock. How much did he lose by changing, and what was his whole income for the year?

Amount of railway stock $=\frac{3500\times100}{87\frac{1}{2}}$£

$$=\frac{7000\times100}{175}£$$

$$=£4{,}000;$$

Income on this for first half-year = £80.

" half of this for second half-year = £60;

" part transferred $=\frac{91\times20\times3}{177}$£

$$=\frac{1820}{59}£$$

$$=£30\ 16s.\ 11\tfrac{11}{59}d.;$$

$\therefore$ Loss in income = £60 − £30 16s. 11d.

$$=\underline{£29\ 3s.\ 1d.}\ \text{Ans.}$$

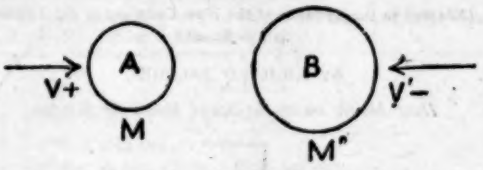
Total income for the year = £80 + £60 + £30 16s. 11d.

$$=\underline{£170\ 16s.\ 11d.}\ \text{Ans.}$$

General.

1. VENUS.—A particle whose mass is 4, moving with a velocity 12, meets and impinges directly on a particle whose mass is 8 and velocity 4; the co-efficient of restitution is 0·5; find, from *first principles*, their velocities at the end of the impact, and what part of their joint kinetic energy has disappeared in the impact. State the dynamical principles employed in answering this question, and define the co-efficient of restitution. (*Theoretical Mechanics.*)

Suppose A and B in the figure below are the particles (or bodies) impinging on each other. Let M and M′ represent the masses of the bodies, V and V′ their velocities before, v and v' those after, collision. We will consider the direction of A's motion as positive, consequently all velocities in that direction must be regarded as positive, and in the opposite direction as negative.



The whole impact may be divided into two stages. During the first, the bodies compress each other, during which process the velocities of the two bodies are being altered, until the moment of greatest compression, when they are both moving with a common velocity. During the second stage, the elastic forces (called the forces of restitution) brought into play tend to make the bodies go back to their original shape, and then separate with velocities still further changed.

Suppose u represents the common velocity at the instant of greatest compression; then the *momentum* lost (in positive direction) by A during the first stage of the impact is $M(V-u)$, and that *gained* Iy B (in + direction) is $M'(u-V')$.

Since these changes of momentum are due to the entire mutual forces acting during this stage of the impact, by the 3rd Law of Motion they must be equal and opposite;

$$\therefore M(V-u)=M'(u-V')$$

$$\therefore u=\frac{MV+M'V'}{M+M'}$$

Since the momentum of A before impact is greater than that of B, it might be anticipated that u will be a positive quantity; which means that at the *moment* of greatest compression the bodies are travelling in the positive direction.

Substituting the given values of M.V, &c., in the above equation we get

$$u=\frac{(4\times12)+(8\times[-4])}{4+8}=\frac{48-32}{12}=\tfrac{4}{3}$$

The Law of Restitution, as derived from experiment, is usually stated thus:—*The ratio which the whole force of restitution bears to the force of compression is constant, whilst the impinging substances remain the same.*

This ratio is called the *co-efficient of restitution.*

Let e represent this co-efficient. From the above law it follows that the momentum lost by A during the *second* stage of the impact bears this constant ratio (e) to that lost during the first stage, and similarly for the momentum gained by B.

$$\therefore \frac{\text{A's change of momentum in 2nd stage}}{\text{A's change of momentum in 1st stage}}=\frac{M(u-v)}{M(V-u)}=e\ (1)$$

Also

$$\frac{\text{B's change of momentum in 2nd stage}}{\text{B's change of momentum in 1st stage}}=\frac{M'(v'-u)}{M'(u-V')}=e\ (2)$$

From (1) we get, $(\tfrac{4}{3}-v)=\tfrac{1}{2}(12-\tfrac{4}{3})=\tfrac{32}{3}$;

$$\therefore v=-\tfrac{28}{3}=-4.$$

From (2) we get, $v'-\tfrac{4}{3}=\tfrac{1}{2}\{\tfrac{4}{3}-(-4)\}=\tfrac{8}{3}$

$$\therefore v'=4;$$

i.e., each body after impact has a velocity of 4 in an opposite direction to its initial motion.

Kinetic energy of A before impact $=\frac{1}{2}MV^2=(2\times144)=288$

Kinetic energy of B before impact $=\frac{1}{2}M'V'^2=(4\times16)=64$

$\therefore$ Joint kinetic energy before impact $=352$

Kinetic energy of A after impact $=\frac{1}{2}Mv^2=(2\times16)=32$

Kinetic energy of B after impact $=\frac{1}{2}M'v'^2=(4\times16)=64$

$\therefore$ Joint kinetic energy after impact $=96$

$\therefore \frac{352-96}{352}=\frac{8}{11}=$ fractional part of original kinetic energy which has disappeared.

NOTES OF A LESSON ON 'THE SEAL.'

BY MRS. W. H. WIGLEY,

Teacher of Method at Cheltenham Training College for Mistresses.

STANDARD II. Time, thirty minutes.

HEADS.	MATTER AND METHOD.	SUMMARY AND ILLUSTRATIONS.
Introduction.	Teacher to show the children Keith Johnston's or other picture of a seal. To fix the picture where it can be well and carefully examined. Slowly and gently to lead the children to notice every feature in the picture :—(*a*) the locality—ice floating on the sea in large blocks ; (*b*) the sloping shore ; (*c*) the only animals visible—the seal. Seals are lying on the shore, seals are swimming in the sea, and seals lying on the ice-blocks. To direct their attention to the different positions of these animals. Those on the shore have been basking in the sun, while those near the edge and those in the sea are trying to get away in a great hurry. Why? Because of those men who are beating them with heavy clubs. Having exhausted the picture in order to claim for herself the attention of the children, the teacher to proceed thus :—	Show picture of seal. Write 'The Seal' on blackboard.
I.—*Structure of the Seal.* (*a*) The head. (*b*) The eyes.	Look at this seal in front, and tell me all you can about his looks. Let us take his head first. What sort of a head? eyes? etc. Direct attention to he pitiful, earnest look—sometimes a dog looks so when he is in trouble. What kind of animals look like this? What makes gentle, loving animals have this look? What will such animals be likely to be to those who are kind to them?	Write the various parts on blackboard.
(*c*) Body and skin.	Lead the children to notice the shape of the body, and its covering. Show a piece of sealskin. Draw from them why it does not need long, soft hair like some animals. Refer them to the difficulty a man finds in swimming in his clothing, and let them see that as the seal is so much in the water it needs a close, thick coat.	Refer to picture and show sealskin.
(*d*) Legs and tail.	Direct attention to its tail and feet—shaped something like a fin of a fish, or a paddle for a boat. Why? Lead them to see that the feet are webbed feet, and draw from them that animals having similar feet can swim well—as water-fowl. *Recapitulation.*	Point to parts on illustration. Draw a webbed foot on blackboard.
II.—*Habits of the Seal.* (*a*) How it gets its food in the sea.	What are the seals in the picture doing? Let the children repeat, 'Lying on the ice,' 'Swimming in the sea,' 'Basking on the shore.' Get them to tell why they do these things. What do they eat? When can they most easily find their food? If the fish see them in the water, what will happen? Why do they watch on the ice? etc. If they are frightened, what will they do? Draw from the children what animals run away when they are frightened. Lead them to see that defenceless animals should be pitied and cared for—that no brave heart will hurt the weak, and that to give pain to anything which cannot take care of itself is cowardly and cruel. Ask the children for instances of such a thing from their own experience—speak of stone-throwing at birds, frogs, etc.	Write 'Seals feed on Fish.'
(*b*) How it goes to sleep on the rocks.	Show that when it has enough food it rests on the rocks—that, though it sometimes dives, it does not keep long under the water, but swims with its head out, like a dog.	
(*c*) How it likes the company of other seals.	If an animal is timid or defenceless, what will it be likely to do? Lead the children to see that many other animals do the like—that a sheep will get into a panic if it finds itself alone, because it cannot fight for itself. Tell the children the story of a tame seal, dwelling upon its way of showing its love for its master, and bringing out its especial characteristics.	
(*d*) How it is easily tamed.		
(*e*) Its love for its young.	Then tell the children of the extreme fondness it has for its young—how it tries to defend them, and will not leave them—and has been known to throw itself into a boat when the little ones have been captured, over and over again, as though determined to die with them, rather than leave them. *Recapitulation.*	
III. *The Use of the Seal.*	Ask the children what sort of an animal the seal is? What we ought to do to such a nice, kind, loving animal. Draw attention to what those men really are doing. Get the children to tell why the men are beating the seals. Show the piece of sealskin again, and lead them to see that the poor loving seal is killed because ladies want sealskin jackets.	
(*a*) Sealskin for jackets.	Ask the children to tell other animals that furnish material for jackets. How do we get wool from the sheep, or hair from the goat? Lead them to see that if we had no way of getting anything without killing animals, then we must kill them, but that we should not kill them in order to be in the fashion. Tell them about the humming-birds, and the slaughter of these beautiful little creatures to provide ornaments for hats.	
(*b*) Flesh for food.	Tell the children that the flesh of the seal is eaten for food by the natives of the countries it frequents.	
(*c*) Oil made from the fat.	Show that oil is also prepared from its fat, which is burned in the lamps. Refer them to the pictures to show how barren the cold countries are, so that there is no wood to make fires, and therefore the natives burn oil in their stoves and lamps. A dead seal is very valuable for its flesh and oil, but where one seal is killed for the sake of its flesh for food, more than twenty are killed for the sake of its skin. Lead the children to see what must be the end of this. *Recapitulation.*	

Practical Perspective for Pupil Teachers.

E. G. BAKER, B.SC., B.A.,
Vice-Principal of the Training College, Carmarthen.

CIRCLES IN VERTICAL PLANES.

The method of projecting a circle in a vertical plane will be sufficiently illustrated by the projections shown in Fig. 86.

The left-hand side of the figure shows the projection of a circle in a vertical plane, making an angle of 45° with the picture plane. The circle is shown in Fig. 85, enclosed in a square. The point A is the point of the circle nearest the picture plane. The line BC is the plan of the circle. This line being placed in position, as shown in Fig. 86, draw the projection of the square. Its diagonals can then be drawn, and next the vertical and horizontal lines

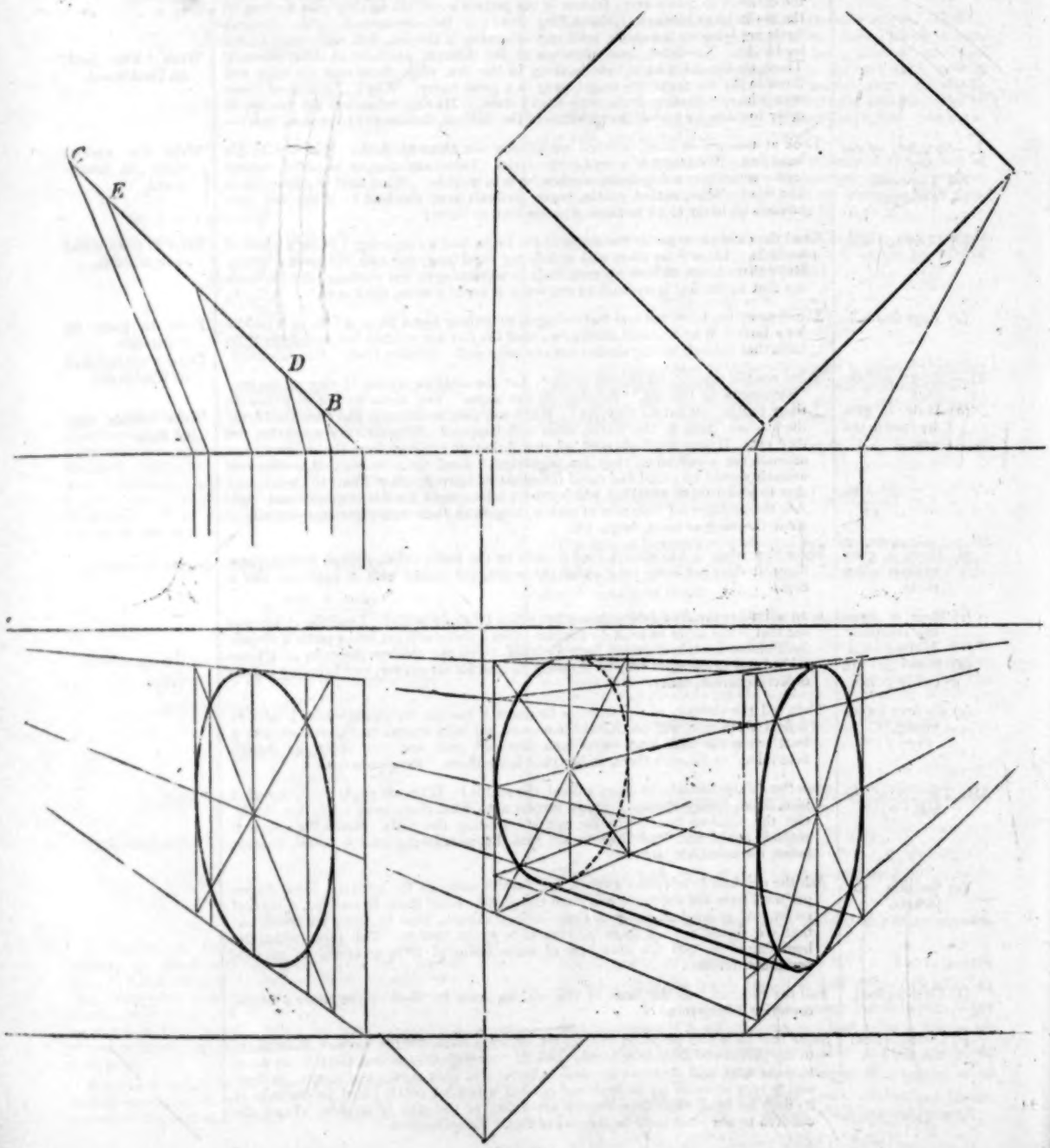


Fig. 86.

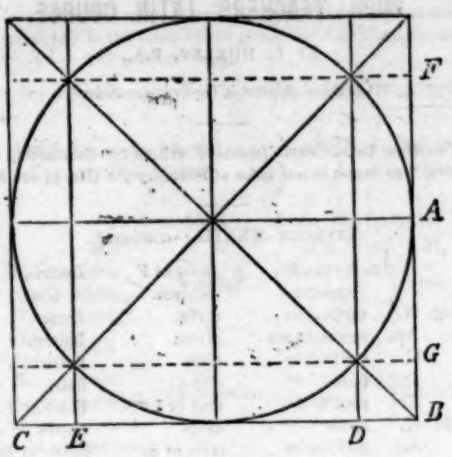


Fig. 85.

through the centre. We then have obtained the projections of four points on the circle. The verticals through D and E give us four other points, and the projection of the circle must then be sketched through the eight points. In sketching be careful to draw the curve so that the sides of the square are tangential.

On the right of Fig. 86 is shown the projection of a right cylinder with its axis horizontal. The cylinder lies on the ground plane, and its axis recedes from the picture plane towards the left at an angle of 45°.

The ends are at right angles to the axis, so that the planes of the vertical circles recede towards the right at angles of 45°.

Note the use of the height line and the horizontal lines through F and G, instead of the verticals through D and E. Be careful to draw two tangents to the circles after projecting the ends, and note that the tangents run to the vanishing point of the axis. Very often the mistake is made of joining the two lowest points of the circles and the two highest.

EXERCISES.—Scale ½ in. to 1 foot. Height of spectator's eye above the ground plane 6 ft., distance of spectator from the picture plane 12 ft.

1. Draw the perspective projection of a right cylinder resting on the ground plane with its axis horizontal and receding from the picture plane towards the right at an angle of 60°. The radius of an end is 3 ft., and the axis is 6 ft. long, while the nearest point of the cylinder is 2 ft. to the left and 1 ft. in the picture.

2. Two concentric circles, radii 4 ft. and 3 ft., are in a vertical plane. Place the same in perspective supposing the plane of the circles to make an angle of 40° with the picture plane towards the right, the lowest point of the larger circle being on the ground at a point 2 ft. to the right of the spectator and 3 ft. in the picture.

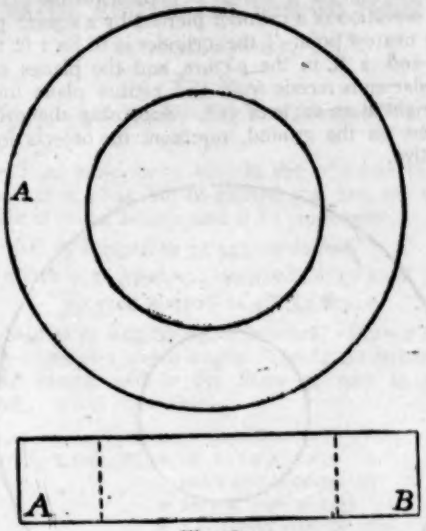
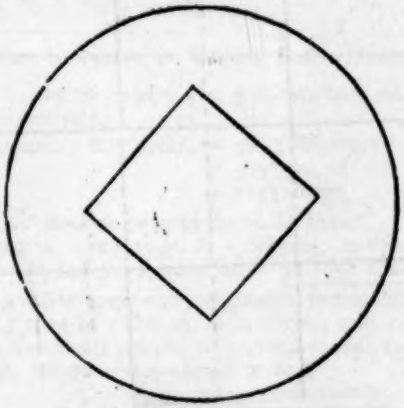


Fig. 87.

3. The diagram Fig. 87 gives the plan and front elevation of a solid ring. Represent the same in perspective supposing the point A to touch the picture plane 1 ft. to the left of the spectator, and the plane of the face AB to recede from the picture plane towards the right at an angle of 40°, the ring standing on the ground.



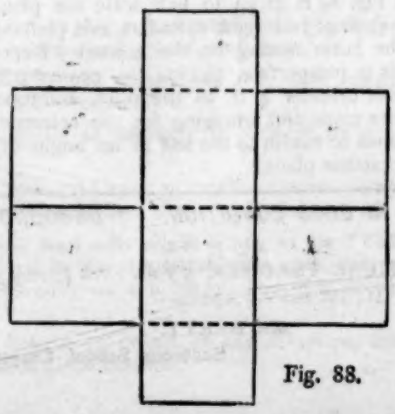


Fig. 88.

4. In Fig. 88 is shown to half scale the plan and end elevation of a cylinder pierced by a square prism. The nearest point of the cylinder is to be 1 ft. to the left and 2 ft. in the picture, and the planes of the circular ends recede from the picture plane towards the right at an angle of 50°. Supposing the cylinder to rest on the ground, represent the objects in perspective.

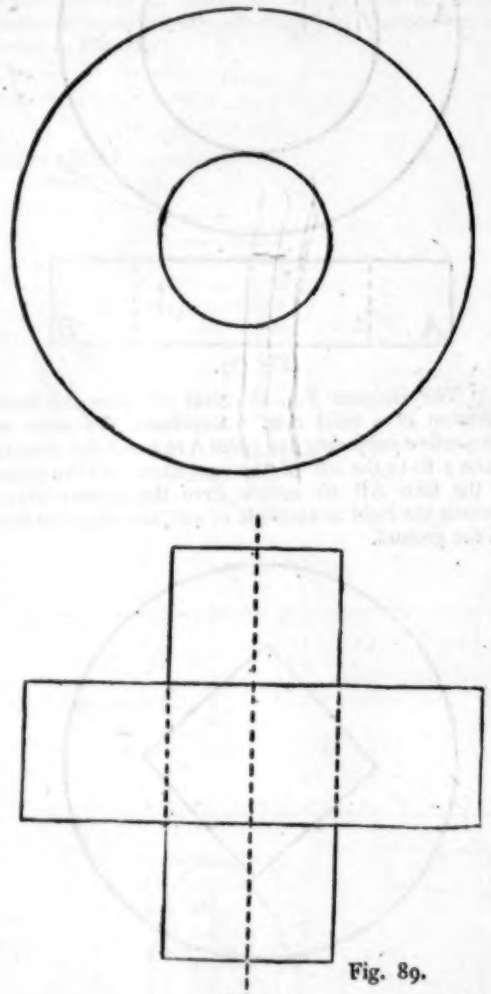


Fig. 89.

5. In Fig. 89 is given to half scale the plan and end elevation of two right cylinders, one piercing the other, the latter resting on the ground. Represent the solids in perspective, placing the nearest point of the smaller cylinder 4 ft. to the right, and touching the picture plane and arranging for the common axis of the solids to vanish to the left at an angle of 50° with the picture plane.

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This New Latin Course (specially written for Scholarship Candidates) was begun in our issue of February 7th (No. 4., vol. XI.).

EXERCISE XXVIII.—*continued.*

		2. *turri-*, F., tower.	3. *cīvi-*, M.F., citizen.	*lintĕri-*, F., boat.
Sing.	N.	turrĭs	cīvĭs	lintĕr
	Acc.	turrim or em	cīvem	lintrem
	G.	turrĭs	cīvĭs	lintrĭs
	D.	turrī	cīvī	lintrī
	Abl.	turrī or ĕ	cīvĕ or ī	lintrī or ĕ
Pl.	N.	turrēs	cīvēs	lintrēs
	Acc.	turrĭs or es	cīvīs or ēs	lintrĭs or ēs
	G.	turrium	cīvium	lintrium
	D. Abl.	turrĭbŭs	cīvĭbŭs	lintrĭbŭs

		4. *nūbi-*, F., cloud.	*monti-*, M., mountain.
Sing.	N.	nūbēs	mons
	Acc.	nūbem	montem
	G.	nūbĭs	montis
	D.	nūbī	montī
	Abl.	nūbĕ	montĕ
Pl.	N.	nūbēs	montēs
	Acc.	nubīs or ēs	montīs or ēs
	G.	nubium	montium
	D. Abl.	nubĭbŭs	montĭbŭs

Decline as *turris*. *Puppĭs*, F., stern, ship; *sēmentĭs*, F., sowing; *messĭs*, F., harvest (Abl. *ĕ*); *nāvĭs*, F., ship; *clāvĭs*, F., key; *fēbrĭs*, F., fever.

3 as *cīvis* (Abl. usually *ĕ*) *aedĭlis*, *aedile*, commissioner of public works; *collis*, M., hill; *unguis*, M., claw, nail; *affīnis*, M.F., kinsman by marriage; *avis*, F., bird; *anguis*, M.F., snake; (Abl. usually *ī*) *amnis*, M., river; *ignis*, M., fire; *aequālis*, equal in age, comrade; (only *ī*) *classis*, F., fleet; *postis*, M., door-post; *finis*, M.F., end.

as *linter*. *Imber*, M., shower.

4. as *nubēs*. Many nouns of this group have Nom. Sing. *es* or *is*. *Famēs*, F., hunger (Abl. *ĕ* as from an e-stem); *vulpēs*, F., fox; *fēlēs* or *fēlis*, M.F., cat; *aedēs* or *is*, F., temple, pl. house; *vallēs* or *is*, F., valley, &c; *cladēs*, F., disaster.

So also many nous is *-is*; *pānis*, M., bread (gen. pl. generally *-um*); *nāris*, F., nostril; *hostis*, M.F., foe; *testis*, M.F., witness; *piscis*, M., fish; *ŏvis*, F., sheep.

as *mons*. Notice that *i* of the stem had dropped before the *-s* of the Nom. suffix, so that the noun at first appears to have a consonant stem. Most of this class end in *-rti* or *-nti*. All pres. participles used as subst., as *parens*, M.F., parent; *serpens*, F.M., serpent; *dens*, M., tooth; *ars*, F., art; *cŏhors*, F., cohort, battalion; *nox* (*-ctis*), F., night; *nix* (*nĭvis*), F., snow; *mūs* (*mūris*), M.F., mouse; *glīs* (*glīris*), M.F., dormouse.

Note.—The usual distinction between cons. and i- stems is that i- stems have the same number of syllables in Nom. and Gen. Sing., while the Gen. of con. stems increases. Hence *mons*, and the like (generally with another cons. before the *s*) are so puzzling.

Adjectives.—1. Adjectives with i- stems have Acc. *em*, Neut. *ĭ*, Abl. *ī*.

2. Adjectives in *-ci-*, or *-ti-* and *di-*, preceded by another cons., drop *i-* before *s* in the nom. for all genders. Abl. *ī* or *ĕ*, as there is no confusion with a neuter in *ĕ*.

3. A few adjectives in *-tri* or *-cri*, form a Masc. Nom. in *-ter* and *-cer*.

4. Some cons. stems adopt *ī* as well as *ĕ* in Abl. (See cons. stems;) Comparatives, in *-ior*.

		1. *brĕvi-*, short.		2. *atrōci-*, fierce.	
		M.F.	N.	M.F.	N.
Sing.	N.	brĕvis	brĕvĕ	atrox	atrōx
	Acc.	brevem		atrōcem	
	G.	brevis		atrōcis	
	D. Abl.	brĕvī		atrōcī, ĕ	
Pl.	N.	brevēs	brevia	atrōcēs	atrōcia
	Acc.	brevis, ēs		atrōcīs, ēs	
	G.	brevium		atrōcium	
	D. Abl.	brevibus		atrōcibus	

amanti-, loving. (pres. part. of *āma-*)

		M.F.	N.
Sing.	N.	āmans	amans
	Acc.	amantem	
	G.	amantīs	
	D.	amantī	
	Abl.	amantī, ĕ	
Pl.	N.	amantēs	amantia
	Acc.	amantīs, ēs	
	G.	amantium (sometimes *um* in poetry)	
	D. Abl.	amantibus	

3. *ācri-*, keen.

		M.	F.	N.
Sing.	N.	ācĕr	ācris	ācrĕ
	Acc.	ācrem		
	G.	acris		
	D. Abl.	acrī		
Pl.	N.	acrēs	acria	
	Acc.	acris, ēs		
	G.	acrium		
	D. Abl.	acribus		

Notes.—2. *Amanti or e.* Adjectives and Participles usually take *ī* when used as epithets, *-ĕ* when used as substantives; participles *ĕ* always when used as participles proper, *e.g.*, in Abl. Abs. or with an object.

Decline as *brevis*. *Grāvis*, heavy; *omnis*, all, every; *facilis*, easy; *ūtilis*, useful; and all adjectives in *-ālis*, *ilis*, *ĭlis*; *immitis*, pitiless.

as *atrox*. *Sāgāci-*, keen; *vēlōci-*, swift; and all verbal adjectives in *-ax*; *praeceps*, st. *praecipĭti-*; *fēlici-*, happy.

as *amans*. All pres. participles. These are formed by adding *-nti-* to ā- and ē- stems, *-enti-* to ĭ and cons. and ī stems. *Ingens*, vast.

as *acer*. *Celĕri-*, quick (keeps *ĕ* throughout); *equestri-*, knightly; and names of months, as *September*, *December*.

At the Countess of Meath's, Lancaster Gate, Mr. Thomas Murby's setting of Mrs. Gwynne Bettany's Juvenile Cantata, '*Elsa; or, the Imprisoned Fairy*,' will be performed, on May 23rd, in costume, for a charitable object, under the direction of the Composer.

THE METRIC SYSTEM, AND HOW TO TEACH IT.

BY CHAS. BOWDEN.

Cubic or Solid Measure in the Metric System.

There is no table for solidity in the schedule to the Metric Act of 1864, but in France the unit for solid measure is called a *Stere* and is a cubic metre.

It is equal to 35·317 cubic feet.

(1 metre = 39·3708 in. 39·3708 × 39·3708 × 39·3708 ÷ 1728 = 35·317 ft.)

Explain as in English cubic measure. Draw a cube having edges of 1 metre length. The figure represents a cubic metre, and is the Stere or unit in solid measure. Then show that—

1 m. = 10 decimetres.
∴ 1 cub. m. = 10 × 10 × 10
= 1000 cub. decim., or
= 100 × 100 × 100
= 1,000,000 cub. centim.

The table is—

10 decisteres = 1 stere.
10 steres = 1 dekastere.
As 1 stere = 1,000,000 cub. centim. or
1000 cub. decim.
∴ 1 decist. = 100,000 cub. centim. or
= 100 cub. decim.
and 1 dekast. = 10 steres, or
= 10 cub. m.

Worked Examples in Metric Solid Measure.

Ex. 1. In 36 dekast. 5 st. 7 decist. how many of each respectively.

36 dekast. 5 st. 7 decist. = 36·57 dekast., or
= 365·7 st., or
= 3657 decist.

Ex. 2. Reduce 3209·57 decist. to dekast.
10 decist. = 1 st. 10 st. = 1 dekast. ∴ 1 dekast. = 100 decist., and 3209·57 decist. = 32·0957 dekast.

Ex. 3. How many cub. centimetres in 609 dekast.? Since 1 stere or 1 cub. m. = 1,000,000 cub. centim. ∴ 10 steres or 1 dekast. = 10,000,000 cub. centim., and 609 dekast. = 10,000,000 × 609,
= 6,090,000,000 cub. centim.

Examples for Practice.

1. Read 72,984 cub. centim. and 5,928,475 cub. decim. in steres and dekast. and decist.

2. Bought 592 dekast. of soil, how many cub. centim. did it contain?

3. Multiply 64 dekast. 7 st. 9 decist. by 7, 35, 99, and 132.

4. Divide 59,172,095 cub. centim. among 8 persons, how many steres and dekast. will each receive?

5. What is the proportion of a cub. millim. to a stere, of a cubic m. to a dekast., and of a decist. to a dekast.?

6. I bought 37 dekast. of hay at 4/- per cub. yd., how much did it cost me?

Metric Measure of Capacity.

This measure is used both for dry goods and for liquids. The unit is called a *Litre*, and holds a little more than 1¾ pints (1·76077 pts.) According to the Metric Act it is $\frac{1}{1000}$th part of a cubic metre, or a cubic decim., which is a little over 61 cubic inches, (61·0277 c. in.) The table is—

10 centilitres	=	1 decilitre.
10 decilit.	=	1 litre.
10 litres	=	1 dekalitre.
10 dekalit.	=	1 hectolitre.
10 hectolit.	=	1 kilolitre.

All the measures except centilitres are used for dry goods. For liquids the following are in use—

1 dekalit, 2 (or double)	dekalit.,	5 dekalit.
1 litre	litre,	5 lit.
1 decilit.	decilit.,	5 decilit.
1 centilit.	centilit.,	5 centilit.

It is hardly necessary to show the working of examples in this rule. Substituting the word litre for metre, the table is similar and the examples would be of the same kind as those in the measure of length. An oral exercise should precede the working of the following examples:—

Examples for Practice.

1. In 3,092,765 centil. how many of each of the measures in the table respectively?

2. Reduce 54 kilolit. 3 lit. 9 centil. to centil.

3. Multiply 64 hectolit. 7 decilit. 5 centilit. by 9, 76, 300, 1,001.

4. From 76 lit. 3 decilit. 5 centil. take 29 lit. 8 centilit.

5. Divide 1,707,572 centilit. of wine among eleven persons; how many lit. would each receive?

6. Find the cost of 729 lit. 5 decilit. of wine at £1 2s. 6d. per lit.

Metric Weights.

The last of the tables named in the Metric Act which authorises the use of the system in England is that of weight. It introduces two words not formed in the ordinary method by means of a prefix to the root. These are *millier* and *quintal*, as seen in the following table:—

10 milligram.	=	1 centigram.
10 centig.	=	1 decigram.
10 decig.	=	1 gramme
10 gram.	=	1 dekagram.
10 dekag.	=	1 hectogram.
10 hectog.	=	1 kilogram.
10 kilog.	=	1 myriagram.
10 myriag.	=	1 quintal
10 quintals	=	1 millier

The gramme is ·56438 drams or 15·4323487 (nearly 15½) grains in weight.

∴ A kilogram is 15432·3487 grains.

As a pound avoir. contains 7,000 grains, a kilog. = 2 lbs. 3¼ oz.

A quintal is 100 kilog., and weighs (2 lbs. 3¼ oz. × 100) = 1 cwt. 108½ lbs. nearly, while a millier is nearly a ton (19 cwt. 76 lbs. 10 oz. nearly).

The following are the weights used in France:—

1, 2, and 5 each of the millig., centig., and decig., for medicines, precious stones.

For common goods, 1, 2, 5 of the gram., dekag., hectog., and kilog.

For greater quantities, 10, 20, and 50 kilog., the quintal, and the millier.

Publications Reviewed.

Elementary Botany. By J. W. Oliver. London: Blackie and Son.

This is a text book mainly designed to meet the requirements of the Science and Art Department. It will doubtless do much more than this, and will, therefore, supply the wants of a wider circle of readers; but it is distinctly of the ordinary type of examination text-books. This is of course partly a recommendation and partly the reverse. There are those who say that examination text-books are the worst kind of text books; there are others who think that if the elements of a subject have to be mastered, the salient points of it had better be put succinctly, logically, dogmatically. Much will depend upon the teacher. This book does not, as it seems to us, attempt to dipense with a teacher. He is supposed to dissect the plants, demonstrate their organs, and illustrate the subject generally. The book, however, supplies all the information which should be expected of a student making a first acquaintance with botany. We believe that the book can be relied on. It seems to us honestly and carefully done; and we have no doubt but that it will serve the purpose intended both by author and publisher.

Elementary Physiology. By Vincent T. Murché. London: Blackie and Son.

This is a companion volume to the 'Elementary Botany.' The present work was originally intended for elementary schools. Its success there led to its being used by those preparing for the Science and Art examination. An enlarged edition has now been issued, and in its present form it is believed that it will prove a valuable guide to the first stage of the Science and Art Department in Physiology.

The book is clearly written, well arranged, and beautifully illustrated. Indeed, the special feature of the book is the beauty of the illustrations. The novelty of printing them in two colours has added much to their clearness. This will be appreciated by teachers generally. There remains the great difficulty of giving an adequate idea of the bodily organs by drawings on the flat. It will be admitted by those who have taught the subject that this is a real difficulty. Knowledge is always better than ignorance. Limited knowledge is to be preferred to total ignorance. Our knowledge of most things is, after all, only partial and approximate. Little harm is done by giving an inadequate impression, so long as it is perfectly well known that it is inadequate. The danger lies in fancying that subjects like Botany and Physiology ever can be learned without a fair acquaintance with the elements of Physics and Chemistry, and then only by studying the phenomena themselves, and at first hand. But we fear this is, to a considerable extent at least, at present only a counsel of perfection. We are able to recommend Mr. Murché's book, and we hope it will prove useful.

The First Book of Kings: Cambridge Bible for Schools. By the Rev. J. R. Lumby, D.D.

This is one of the smaller parts of the important work now so well known by all who are engaged in religious teaching. It is marked by the same fulness, accuracy, and judgment which has characterised the volumes previously issued. We have nothing but praise to offer in regard to the work of the editor and publisher, always excepting the one, and, to us, unpardonable error which we have pointed out from the first, the small print and the overcrowded pages. Possibly this objection is not shared by those who are responsible for the issue. And if they were the persons who had to use the book they might be left to indulge in their own individual preferences, but, unfortunately, the books will be used by Sunday scholars and other young persons whose eyes will not be improved by poring over this small print; nor will they take up the book with delight. Why should books cease to be attractive when they aim at giving instruction? Even less matter might be of more service if presented in more captivating manner.

Euclid's Elements of Geometry. By A. E. Layng, M.A. London: Blackie and Sons.

This edition of the Elements is marked by one or two important features which distinguish it and give it its special value.

Very free use is made of such abbreviations as are recognised by the examining bodies of the country. This gives a clearness to the page and a relief to the eye which are very refreshing.

The proofs, while essentially those of Euclid, are shortened here and there, and in a few cases new proofs are substituted for Euclid's.

The exercises are a valuable part of the book. They are numerous and well graduated. The usual additional propositions of important truths not contained in Euclid's Elements are given at the end of each book. The printing and binding are all that can be desired. On the whole we consider this a very valuable text book, and have pleasure in heartily recommending it.

Notabilia of Geography: Part I. Topographical Geography: Part II. Commercial Geography: By Walter Blanchard, A.C.P. London: Thomas Murby.

These two unpretending little books contain a marvellous array of names and facts for the furnishing of the examination candidate. The second title of the first part is map lessons, and if used with constant reference to maps it is calculated, with its systematic classification and columnar arrangements, to afford much assistance to the memory.

The second part supplies very full information on Foreign and British trade, imports, exports, and means of communication. The fulness of this information may be judged of from the fact that the list of imports into this country, with the places of production and exportation, occupies about twenty pages. These are followed by eight pages explanatory of the nature of the most important imports.

The section on *Highways of Commerce* is particularly satisfactory. Under the several heads of Routes of British Steamers, Railway Routes, Waterways, and lines of Telegraphic Communication, almost exhaustive information of a general kind is given on the means of commercial intercourse. Another section treats of the various countries of the world as Commerce Producers.

As compact text books of geographical and commercial facts these Notabilia may be warmly commended.

Certificate of Merit: London, Cassell and Co.

Messrs. Cassell and Co. have just issued some new Certificates of Merit to be presented to scholars after passing the Annual Examination. They are in three sizes, and the borders, drawn and copied in colour by Mr. Louis Davis, are reproductions of some of the most beautiful designs found in the famous Irish 'Book of Kells,' the Flemish 'Book of Hours,' and the Tréves MS. copy of the Gospels. For beauty of design and colouring, and for skill displayed in their production, it would be difficult to find their equal. They are soal remarkably cheap.

Songs for Schools. Words by Edward Oxenford. Music by A Scott Gatty and S. C. Cooke. Griffith, Farran, Okeden, and Welsh.

This is a quarto volume of songs suitable for school, home, and playground. The accompaniments are easy, the airs are bright and taking, and the words such as might be expected from one of the best lyric writers of the day.

—o—

The 1891 Scholarship Examination.

BY DR. GEORGE BEACH, M.A.

Co-Author of 'A Manual of our Mother-Tongue,' Author of 'Elements of English,' 'Entertaining Readers.'

SCHOLARSHIP ENGLISH—(*continued*).

A thorough knowledge of the SYNTAX of our language is of course of prime importance, as, without it, it is almost impossible to write correctly, and most certainly Analysis and Parsing cannot be accurately done if such knowledge be lacking.

Even in Latin and Greek, and in fact in all highly inflected languages, Syntax is necessarily essential; but much more so in Languages like English, which are comparatively non-inflective, and where the FORM of the word tells but little of its function.

Besides the ordinary *Concords*, our pupils should look-up the Nominative Absolute, the Possessive Case, the different uses of the Relative Pronoun, the various ways in which the Objective Case is employed, the Subjunctive Mood, the Gerund, the Participle, and the Conjunctions. The difficult question of Adverb *versus* Preposition *versus* Conjunction requires careful attention.

In PARSING, the student should proceed from the greater to the less, telling first the Part of Speech of the word, then its Accidence and Syntactical relation.

In *Nouns* the Person is often unnecessarily omitted, in *Adjectives* the Degree, in *Verbs* the Voice and the word governed, in *Conjunctions* the class.

Parse a Possessive Case as qualifying (because it is o. the nature of an Adjective); don't speak of a Noun as Nominative to a Verb, but say, *e.g.*, '*Nom. Subject to smite*,' etc. Neither omit, as is often done, the Antecedent of a Relative Pronoun.

Some words, such as Gerunds, Participles, and Relative Adverbs, discharge two functions. Take care that both these are mentioned, as, for instance, '*The man* WHISTLING *a tune went his way*.' In this case mention both the qualifying and governing power of 'WHISTLING.'

Many people do not completely parse a Verb in the Infinitive Mood, but simply write 'Verb, Infinitive Mood.' This is totally insufficient. Take the sentence '*I come to bury Cæsar*.'

to bury—Verb, Regular (weak), Trans., Act. V., Infin., Pres. T., Modifies 'come' (reason) and governs 'Cæsar' in the Objective Case. (See p. 155 of 'Practical Teacher.')

IN ANALYSIS we have a choice of two forms, each of which may be more or less complicated, viz., the extended form and the tabulated. We have no hesitation in pronouncing strongly in favour of the latter. It saves time in writing down, it classifies the same parts of sentences under each other, and it is much easier to examine. The following is the style that we recommend:—

SENTENCE	KIND OF SENTENCE	CONNECTIVE	SUBJECT		PREDICATE		OBJECT	
			Simple	Enlargement	Simple	Extension	Simple	Enlargement
	—							

As regards PARAPHRASING, it is altogether too wide and too artistic a subject to yield any profit to anything but painful and systematic study.

Any one practised in translating from a foreign language into English will find himself well prepared for Paraphrasing.

The requisites for excellence in this art are:—

(*a*) A SUBTLE AND WELL-BALANCED MIND, quick to penetrate to the meaning and vital essence of each word and of the whole sentence, and not liable to be drawn aside by, or to pay too great attention to, the mere verbal form.

In other words, the true idea and soul of the passage to be paraphrased must be discerned by the artist, just as the design of a picture or the *motif* of a melody must be grasped. The inward and spiritual idea must be reclothed in words, and not merely one outward and visible verbal sign substituted for another:—

(*b*) A COPIOUS AND WELL UNDERSTOOD VOCABULARY, the nicer shades and finer gradations of whose meaning must be well grasped.

In connection with this, it is too much the fashion to decry a knowledge of synonyms because their employment has been abused, and because paraphrasing by their means has been made the substitution of words instead of the reclothing of ideas.

A Frenchman once placed this synonymic paraphrasing in a most ludicrous light by rendering—

'Hail, Horrors, Hail!' by

'How d'you do, Terrors? How d'you do?'

Nevertheless, synonyms may freely be utilised, provided always they be kept in due subordination to the expression of the idea:—

(*c*) SKILL IN ORDINARY COMPOSITION.—As none but literary masterpieces should be set for Paraphrasing, it follows that in all probability the writer has selected the most fitting words, and the best terms of expression. How difficult therefore it is to express (say) a Shakesperian idea, when the poet has unkindly used up all the best words! How doubly difficult—rather, how utterly impossible—then, it must be for one who cannot well express his own thoughts in an ordinary essay!

SELECTED GOVERNMENT QUESTIONS.

1. (*a*) Simplify $2\{3a - (4b - 5c)\} - 3\{4a - (5b - 2c)\} + 4\{5a - 3(b - c)\}$. Ans. $14a - 5b + 16c$.

(*b*) Find the value of $\frac{7x^2 - 10xy + 3y^2}{7x^2 + 10xy + 3y^2} - \frac{20y}{33x}$ when $x = 5$ and $y = 3$. Ans. $\frac{1}{11}$.

2. A and B have two guineas between them; and if A give to B one shilling for every penny B had, A will then have ten shillings less than B. How much had each at first?

Ans. A, £2; B, 2s.

3. (*a*) If a parallelogram and a triangle be on the same base, and between the same parallels, the parallelogram is double of the triangle.

(*b*) T is any point within a parallelogram PQRS, and lines are drawn from it to the angles. Show that the triangles TPQ, TRS are together equal to the triangle PQR.

4. (*a*) If a straight line be divided into any two parts, the square on the whole line is equal to the squares on the two parts, together with twice the rectangle contained by those parts.

(*b*) PQR is a triangle right-angled at P. S is a point in PR, T is a point in PQ. Prove (by I. 47) that the sum of the squares on RT, SQ is equal to the sum of the squares on QR, ST.

5. Find the cost of painting the outside of a dog kennel 5 ft. long, 2 ft. wide, each side being 2 ft. high, and the perpendicular height of the ridge of the roof from the ground being 3½ feet at 3d. per square foot. N.B.—The square front is entirely open; the bottom is included. Ans. 13s.

6. A man bought 240 cows at a foreign port, paying £12 6s. for each, and 128 sheep at £1 17s. 6d. per sheep. Their carriage to London amounted to $\frac{1}{12}$ of the price paid for them. He then exchanged them for 221 ponies, which he sold for £17 per head. What did he gain? Ans. £432.

7. If a profit of 5 per cent. be made by selling goods for £384 12s. 6½d., what did they cost? Ans. £366 6s. 3d

8. Find the length of the longer side of a parallelogram, one angle being half a right angle, the altitude being equal to half the base, and the area containing 1,250 sq. feet. Ans. 50 ft.

9. Give a brief account of the reign of George IV. and the Indian Mutiny.

10. Mention the Prime Ministers of the last four administrations, and name six of the present Cabinet Ministers.

11. Draw a diagram of the Solar System.

12. Account for the greatly varying length of the day within the Arctic circle. To a spectator standing at the North Pole, where are the four chief cardinal points?

13. What are the proper prepositions to use after the following words?—

Absolve	*Conform*	*Similar*
Accuse	*Decide*	*Different*
Bias	*Habit*	*Yearn.*

14. Give the Greek equivalents for:—

against	*false*	*like*
through	*small*	*-ling*
half	*belonging-to*	*marriage.*

15. What objects should be kept in view in the teaching of Mental Arithmetic? Show how these objects may be best attained, and give some examples of good oral exercises suitable to Standard II.

16. It is sometimes complained that children do not read well because their reading lessons are constantly interrupted by the oral spelling of the more difficult words. Do you consider such interruption necessary, and (if not) how may good spelling be obtained without it?

17. How would you spend £8 on an outfit for a girl of fifteen going to her first place who was to leave her old clothes for the children at home?

18. 'Food is required for the supply of wasted material in the body, and for the production of heat.' Explain fully what is meant by this statement, and say also what portion of our ordinary diet is useful for either of these two purposes.

19. Write in Largehand six lines of
'Anthropomorphology,'
and in Smallhand—
'Iron sleet in arrowy shower
Hurtles through the darkened air.'

20. SCOTCH CODE:

(*a*) Name three Scotch authors of the Middle Ages, and three Scotch poets of the 19th century, giving their chief work in each case.

(*b*) If from a point without a circle there be drawn two straight lines, one of which meets the circle and the other cuts it, and the rectangle contained by the whole line which cuts the circle and the part of it without the circle be equal to the square on the line which meets it, the line which meets is a tangent to the circle.

Two circles of unequal radii exterior to each other have a common tangent; if two other tangents be drawn from the point of bisection of this common tangent, they will not be in the same straight line.

(*c*) Name the wives of all the Tudor kings. What was the nationality of each?

(*d*) Prove the truth of the statement that the sun never sets upon our Empire.

WEEK COMMENCING 11TH MAY, 1891.

DAYS.	FIRST HOUR.	SECOND HOUR.	THIRD HOUR.
M.	Problems in Fractional Simple Equations *or* Questions on Needlework	Dynastic Tables of the Stuarts and Hanoverians.	Latin *or* French.
TU.	Euclid, Book II., to Prop. VII. *or* Calico Sampler	Geography of Mexico.	Science.
W.	Mensuration of Triangles *or* Stocks.	Drawing.	Table of Literature in English Text Book.
TH.	Simultaneous Equations of the First Degree *or* Savings and Investments.	History from 1763 A.D to 1783 A.D.	Latin *or* French.
F.	Deductions on Euclid, Book II., *or* Calico Sampler.	Geography of Central America.	Science.

S.	Square Root.	Revise History of Plantagenet Period.	How to teach Spelling.	Latin Roots.

REMARKS ON ROUTINE.

(*a*) PROBLEMS IN FRACTIONAL SIMPLE EQUATIONS.
Hamblin Smith, p. 121, Example LIX., sums 48 to 54.
Charles Smith, p. 149, Example XLII., sums 25 to 30.
Todhunter, p. 110, Example XX., sums 42 to 47.

SIMULTANEOUS EQUATIONS OF THE FIRST DEGREE.
Hamblin Smith, p. 161, Example LXXVIII., sums 46 to 50.
Charles Smith, p. 87, Example XXI., sums 10 to 15.
Todhunter, p. 157, Example XXV., sums 20 to 24.

(*b*) ARITHMETIC.
Males, Pendlebury, pp. 292 and 293, Examples CLXXXI. and CLXXXII. sums 14, 15, 16 in each.
Females, Dixon and Beach.—(1) p. 279, sum 3; p. 282, sums 1, 2, 3, 4. (2) pp. 216 and 218, Examples XL. and XLI., sums 1, 2, 3 in each.

(*c*) MENSURATION.
Pages 36 and 77, Examples VI. and XIII., sums 2, 3, 4 in first and 1, 9, 28 in the second.

(*d*) HISTORY.
Sanderson, pp. 316 to 326.
Ross, pp. 376 to 390.

(*e*) GEOGRAPHY.
(1) *Moffatt*, pp. 346 to 348, (2) pp. 348 to 350.
Anderson, pp. 180, 181, (2) pp. 182 and 183.

(*f*) ENGLISH.
Dr. Beach's '*Elements of English*,' (1) pp. 177 to 179, (2) Revise pp. 187 to 193.

(*g*) LATIN.
Read *Mr. Huxley's* Article, and chapters 47 to end of '*De Bello Gallico*.'

FRENCH;
Master pp. 150 to 163 of *Professor Darquet's French Course*, and pp. 66 to 72 of '*La Jeune Sibérienne*.'

(*h*) Study the measurements and draw diagrams of a chemise and night-shirt.

CORRESPONDENCE.

PADDY (Crewe).—Dunstan's 'Teacher's Manual of Music.'

G. V. (Bournemouth), L. M. (Bradford), SKIT (Chester), ALICK (Dundee), S.L. O. (Stockport), J. P. (Manchester), USE (Cardiff), and others.

La Jeune Sibérienne:

(1) *Page 1.*—Even if the account of her adventures does not excite that lively interest which a novelist can arouse respecting fictitious characters, yet doubtless the simple story of her life (which is sufficiently attractive in itself, without any further adornment than its actual truth) will not be read by any one without a certain pleasure.

(2) *Page 11.*—The mother and daughter succeeded in soothing him, by mingling their tears with his own.

(3) *Page 13.*—Her father, whose momentary pleasantry was inconsistent with his usual behaviour, soon reassumed his sternness. Whilst he scolded her for crying, her affectionate mother, with a smile, embraced her.

(4) *Page 16.*—I only prayed for a moment by the river side, and although my linen has not yet returned of itself, at any rate it has come without me, and by means of an infidel.

(5) *Page 19.*—The application of this passage of Holy Writ was too patent to allow the striking analogy which it presented to the purposed journey to be able to escape any one.

(6) *Page 23.*—As soon as the news spread itself throughout the village, all their acquaintances came to visit her, urged rather by curiosity than by real sympathy.

(7) *Page 26.*—It was a white lie (a little fib) she used to say when relating her first adventure, but it did me no harm.

(8) *Page 29.*—They placed her upon a waggon; and the very children who had insulted her but a short time previously were eager to draw her. Thus they conveyed her to the villager's (*fem.*) house.

(To be continued.)

Needlework for Pupil-Teachers.

BY MISS SOPHY LOCH,
Examiner of Needlework to the London School Board.

7. The sleeves must now be made. One of the easiest ways of cutting these out is to take a piece of material the required length, the width being the same as the width of the body of the shirt, and divide it into thirds. The material is then folded across from the first third at the top to the second third at the bottom and cut—one part will make sleeve No. 1, and

the other sleeve, No. 2. The part of the sleeve which runs with the self-edge is put to the side on the cross, and the surplus at top and bottom cut off. The sleeve at the wrist should also be a little rounded.

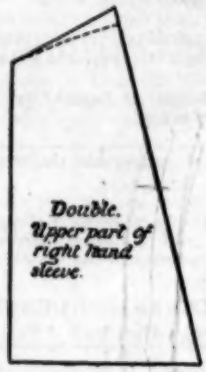

Fig. 27.

The diagram represents the sleeve (double). The dotted line at wrist indicates where it should be slightly rounded.

If the armhole of the shirt be shaped, the sleeve must be shaped at top to correspond. The binders, in that case, must also be shaped.

The straight part of the sleeve comes to the front, the cross-way part to the underneath portion of the arm, so as to allow for the play of the elbow. In making up the sleeves, the seams must fall to the front, and the fell to the back; in fixing the seam the *straight part* of the sleeve has therefore to be turned twice. The wristbands should be closed for a night-shirt. They should be joined by running and back-stitching on the wrong side, and the raw edges afterward turned out flat—see Fig. 28. The row of stitching put at the top of the wristband should be worked *after* it is joined—see Fig. 29.

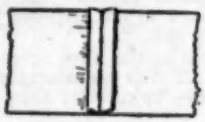

Fig. 28.

Fig. 29.

The gathers of the sleeve should not extend all round the arm, but should be placed at the outward bend of the wrist. The sleeves are put into the armholes last of all; they should therefore be carefully folded up and put away while the remainder of the shirt is finished.

8. The cutting of the neck slope and the fixing of the collar now requires attention; this is by far the most difficult part of the shirt, and where so many well-worked shirts are spoilt. The collar, we will suppose, has been made the requisite length, and appears as in Fig. 30.

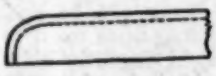

Fig. 30.—Portion of Collar.

A part only of the collar is shewn. Both ends are rounded. The collar, which is of course double, must be cut in two pieces, joined by running and backstitching, turned over and stitched, as in diagram. The yoke has been slightly hollowed out at the back to allow it to set well on the back of the neck, and now the question arises, how much is the neck to be hollowed out in the front? The collar should first be fixed on to that part of the neck which is already sloped from X to X in Fig. 31.

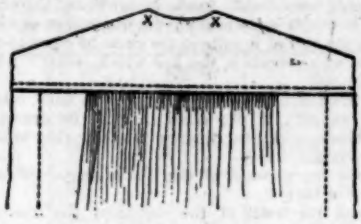

Fig. 31.

Miss Jones (late Directress of Needlework to the Education Department) gives in one of her books a very useful hint to amateur shirt-makers on this point. The word "amateur" is here used in contradistinction to professional shirt-cutters and shirt-makers. She directs that the collar should be first fastened on to the back of yoke from X to X in Fig. 31, and then that the remainder of the collar (*doubled*) should give the depth of the hollowing out of the neck. This rule cannot always, of course, be strictly adhered to; still it gives those who are not much accustomed to shirt-making, a very good idea of the main lines on which to proceed for the neck. It must always be remembered that a good deep curve must be made from the shoulder, and that from the deepest part of the curve, the front part of the shirt should be cut straight, to allow for the proper set of the collar. The part to be gathered lies between the curve of the neck and the front band or hem, viz., from X to X, Fig. 32.

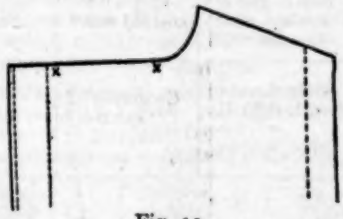

Fig. 32.

9. Three button-holes are required for fastening the shirt, one on the collar running parallel with it, with a round and a square end, and two on the front band also running parallel to it, with two square ends. Corresponding buttons must be put on. They will be on the right-hand side of the shirt, and the button-holes on the left-hand side.

10. The flaps of the shirt must now be hemmed. These are sometimes left square, and sometimes rounded. If left square, the *sides* must be hemmed first, and then the *bottom* of the shirt. In preference to hemming, the flaps are sometimes turned up on to the right side and stitched, which gives the shirt a very neat finish. At the bottom of the side-seams, hip gussets must be placed, to strengthen the opening.

(To be continued.)

No. 19.

1. Multiply £238 19s. 6¼d. by 124.
2. Reduce 36 ac. 3 roods 0 pls. 28 sq. yds. to sq. yds.
3. Reduce 48,629 ozs. to tons.
4. From 2,040 guineas take 2,040 half sovereigns.

No. 20.

1. Multiply £596 17s. 10¾d. by 213.
2. Reduce 85 tons 17 cwt. 3 stones to lbs.
3. How many miles are there in 5,948,627 yds?
4. I buy 5,000 oranges at 9d. per dozen and sell them at 1½d. each. What do I gain?

ANSWERS.

No. 1.

1. £51,363 13s.
2. 18,310½ ft.
3. 42 tons 1 cwt. 1 qr. 16 lbs.
4. £6 5s.

No. 2.

1. £28,651 15s. 9½d.
2. 331 tons 3 cwt. 3 qrs. 9 lbs.
3. 172,800 minutes.
4. £17 6s. 8d.

No. 3.

1. £94,562 10s. 6½d.
2. 15 mls. 0 fur. 27 pls. 2½ yds. 1 ft.
3. 679 gallons.
4. 7,040 half-yards.

No. 4.

1. 280 tons 19 cwt. 3 qrs. 20 lbs.
2. 115,827¼ sq. yds
3. £2.
4. £24,296 17s. 1d.

No. 5.

1. £67,486 2s. 5½d.
2. 1,459 qts. 6 bus. 1 pk.
3. 459,485¾ sq. yds.
4. £4 12s. 10¼d.

No. 6.

1. 119 mls. 1 fur. 27 pls. 1½ yds. 2 ft.
2. 107,480 lbs.
3. 1½ miles.
4. £14,341 5s. 6d.

No. 7.

1. 17 mls. 6 fur. 39 pls. 3 yds.
2. 150,544 ozs.
3. 9s. 4d.
4. £1,041 8s. + 49.

No. 8.

1. £156 16s. 2¾d + 9.
2. 476 pls. 0 yds. 2 ft. 4 in.
3. 430,048 drams.
4. 1,728 lamps.

No. 9.

1. 76,914 13s. 9d.
2. 1 ton 13 cwt. 0 qrs. 2 lbs. 9 oz.
3. 5 dys. 14 hrs. 47 min. 47 secs.
4. £15 7s. 6d.

No. 10.

1. £26,588 7s. 10¼d.
2. 212,660 lbs.
3. 9,691 yds. 0 ft. 10 in.
4. £4 18s.

No. 11.

1. £7,325 11s. 7½d.
2. 26 cwt. 1 qr. 13 lbs. 5 ozs.
3. 7,494 inches.
4. £50.

No. 12.

1. £437 8s. 8d. + 129.
2. 128 stones 5 lbs. 11 ozs.
3. 18,982 yds. 1 foot.
4. £14.

No. 13.

1. £9,500 18s. 11½d.
2. 422 tons 8 cwt. 1 qr. 6 lbs.
3. 261,178½ ft.
4. 2,000 sixpences.

No. 14.

1. £145,980 18s. 9d.
2. 253,093½ ft.
3. 38,577 weeks 4 dys. 3 hrs.
4. £25.

No. 15.

1. £97,320 12s. 6d.
2. 157,399 yards.
3. 414 cwt. 0 qrs. 0 lbs. 5 ozs.
4. £43 7s. 6d.

No. 16.

1. £60,793 14s. 8¾d.
2. 3,198 gals.
3. 1 wk. 4 dys. 12 hrs. 19 min. 29 secs.
4. 41 acres 1 rood.

No. 17.

1. £63,792 11s. 5d.
2. 422 tons 13 cwt. 0 qrs. 2 lbs.
3. 8,360 yards.
4. £126 2s.

No. 18.

1. £48,151 15s. 11½d.
2. 158,136 yds.
3. 362 cwt. 2 qrs. 17 lbs. 1 oz.
4. £21 17s. 6d.

No. 19.

1. £29,633 0s. 7d.
2. 177,898 sq. yds.
3. 1 ton 7 cwt.
4. £1,122.

No. 20.

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